

The Use of Technology In Education and Professional Development

For Health Care Providers

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Introduction

Continuing professional development (CPD) has become increasingly important as more businesses and organizations recognize the importance of life-long learning and its role in decreasing mishaps and increasing productivity. One field that has long required its members to take part in CPD is health care. Both physicians and nurses must engage in CPD on a regular basis to maintain their skills and increase their knowledge of new research. Technology plays a growing role in both pre-clinical education and post-clinical CPD.

This paper will give an overview, through a review of the literature, of how technology is being used for education and professional development among health care providers with the purpose of determining what is currently being done and what areas can be improved upon and expanded. The paper is organized into four sections. Section one addresses the current requirements for professional development among health care providers in Canada. Section two looks at how technology is being used for education and professional development among health care providers. Section three explores some of the barriers to health care providers utilizing technology for these purposes. The paper concludes with a brief look at what areas can be improved and expanded to better assist health care providers.

Professional Development For Health Care Providers

A family physician must complete 250 credits in continuing medical education (CME) every five years in order to maintain his or her membership and certification with The College of Family Physicians of Canada. A Fellow in the Royal College of Physicians and Surgeons must complete 400 hours of continuing professional

development (CPD) every five years. A registered nurse in Canada must complete a minimum of 100 hours of continuous learning (CL) activities within their specialty every five years as part of their recertification with the Canadian Nurses Association. As an alternative, they may take the current certification test for their specialty, but most RNs choose to complete the CL activities instead. These hours can be completed through either completion of academic courses or through attending a conference, teleconference, seminar, or workshop.

Every year, physicians and nurses complete the majority of those credits by attending conferences, but attendance can prove to be a hardship for many due to location, practice load, and shift schedules. In addition, attendance at conferences is not a good way to ensure long-term retention of knowledge. Picciano, Winter, Ballan, et al. (2003) found that residents who attended mid-day conferences, a common practice in medical education, showed no greater retention of knowledge over a long period of time than their counterparts who did not attend the conference series.

Technology, Education, and CPD For Health Care Providers

Through the use of technology, CPD is being offered on-site and at a distance to professionals and other workers for ongoing and just-in-time training. Computers and other forms of technology are being used for professional development in a variety of fields including education (Moore, 2002; Powers & Barnes, 2001), law (Tebo, 2000), and even among government workers (Saunders, 2003; Williams, Bisby, Moll, et al., 1997). The use of technology for education and professional development makes it easier for individuals to take part in on-going learning because it is often more convenient and allows for self-directed, active learning (Mamary & Charles, 2000).

Medical schools, teaching hospitals, and professional associations have been making use of technologies to aid in the training and upgrading of skills of both pre-clinical and post-clinical health care providers. The use of technology provides the opportunity for self-directed, problem-based learning, involving collaboration, elements often missing from traditional methods of education and professional development. These programs are making use of these technologies for on-site training, as well as at a distance.

On-Site Use of Technology

Just-in-time education, a concept first developed by the business sector is becoming more popular in many fields, including health care. With just-in-time education, the learner learns what they need to know, when they need to know it, and often in the context in which it will be used (Sambataro, 2000). Knowledge that is obtained by a physician, nurse, or student where they are treating patients, is more likely to be remembered by the learner (Nissen, Abdulla, Khandheria, Kienzle, & Zaher, 2004). In addition, making learning resources such as databases or journals available for health care providers to easily access them when needed will also help them gain just-in-time knowledge required when treating patients.

Vozenilek, Huff, Resnek, and Gordon (2004) noted the use of the Internet and human patient simulators (HPS) in on-site medical education. This paper will address these instruments as well as other forms of simulations and the use of personal digital assistants (PDAs) for on-site training whether it is just-in-time or ongoing education.

The Internet. The Internet has proven to be a valuable tool for physicians and nurses. They use it to look up journal articles and communicate with colleagues. By

providing physicians and nurses with access to the Internet at the hospitals they work in, they are given the opportunity for day-to-day professional development that they might not otherwise have. For example, nurses often work shifts that may prevent them from using the Internet in libraries and they may not have the necessary permissions to access journals from home (Tod, Harrison, Docker, Black, & Wolstenholme, 2003). If they have Internet access at their work, which they can access before, during, or after their shift, then they can make better use of this technology to aid in patient care and to further their own training. Tod's study also found that the nurses who used the Internet at the hospital were more likely to share information and provide assistance to their colleagues than if they had used computers at home or in the library.

Personal digital assistants. Desktop computers or even laptops with Internet access are too bulky to carry around from patient to patient, and cost may limit the number of these computers that one facility can afford. Personal Digital Assistants (PDAs) offer many of the same features at a fraction of the size, and price. PDAs with medical related software installed provide physicians, nurses and students with information when and where they need it, including information on specific patients, research, and drugs (Bakken, Cook, Curtis, et al., 2004; De Groote & Doranski, 2004). By having this information at the ready, health care providers can save time and be better prepared for treating patients. But PDAs are also playing a role in education and professional development for physicians and nurses.

In a review of the literature by Torre and Wright (2003), the authors found PDAs in wide use in medical education. They found that 67% of family residency programs in the United States made use of PDAs and that the most common uses were for logging

patient information and as a pocket-sized reference tool. Users are able to download journal articles from websites and databases for reading or referencing from them their PDAs at a later time.

The Department of Radiology at Beth Israel Deaconess Medical Center introduced a PDA-based system as part of its residency program (Nishino, Busch, Wei, et al., 2004). Through this, residents are able to access relevant reference materials, the first-year resident guide, call-schedule, and the case of the week. Residents can view radiological images and the pertinent reference material needed to make a diagnosis, all on the PDA screen. The information and images are all available through the hospitals intranet system.

Kurth, Silenzio, and Irigoyen. (2002) reported that medical students at Columbia University were using PDAs as logs so that the variety of patients they were seeing could be tracked to ensure that they were seeing a wide range of cases. Before this, students had been keeping paper logs or cards that could be optically scanned. Kurth's study found that the use of PDAs for this resulted in less missing data and that this form of log seems to be more adaptable and flexible. The Columbia University School of Nursing is also using PDAs as part of their entry to-practice (ETP) and Master's programs in an effort to improve patient safety (Bakken, et al., 2004). The software needed for the PDAs varies depending on the area of nursing, with some providing information on medications and their interactions while others aid in diagnosis and managing cases.

Simulators. Another form of technology that plays a significant role in training physicians and nurses is the simulator. More medical and nursing training programs are making use of these devices in an effort to allow individuals to learn without risk to

patients (Vozenilek, et al., 2004; Wong, 2004). Technological simulators may involve only a computer program that allows for interaction with a fictional patient or they may be as extensive as a recreation of an entire human body.

Gunther, Soto, and Colman. (2002) reported on the use of simulators to train surgeons to perform knee-replacement surgeries. Through a three-dimensional, interactive computer tutorial, physicians can study necessary steps for a total-knee-replacement (TKR). Students are encouraged to go through the tutorial several times to help cement the knowledge. Gunther's study found that those students who completed the tutorial performed better when trying the procedure on a model using real instruments, completing the TKR in less time and with fewer errors than those who had only read the materials on how to do a TKR.

At the other end of the simulator spectrum is the human patient simulator (HPS). Medical schools have been using HPS units for more than twenty years and nursing programs began using them in the past decade (Nehring & Lashley, 2004). These simulators may resemble the models used for first-aid training but include computers that will record how the patients would have responded given the actions of the physician or nurse.

Sin-Man from Laerdal is an example of a HPS. The included software allows for the mannequin to simulate either a child or adult, male or female patient, and allows for a variety of different procedures to be performed under realistic circumstances (Peteani, 2004). Sin-Man allows for practicing intubations, IV insertion and drug administration, catheterization, along with several other common procedures. To add to the realism of the

situation, Sin-Man recreates responses such as vomiting, coughing, changes in blood pressure and respiratory functions, as well as sounds including moaning (Laerdal, 2005).

Wong (2004) noted that the use of HPS for instruction in anesthesia allows for training in emergency care without risk to patients and provides students and practicing anesthesiologists the opportunity to experience cases that may be rare. The simulator is hooked up to the same monitors and machines that would be used on a actual patient. As the physician, student, or nurse performs a procedure the computer in the HPS recreates what would happen to the patient and sends a signal to the monitors.

Simulators are an excellent way to learn through a problem-based approach. Problem-based learning (PBL) involves presenting the learners with a problem to solve using their prior knowledge, discussions with others, and information they find on their own or that is presented with the problem (Wood, 2004). PBL provides learners with the opportunity to learn in a context similar to situations they will experience when treating actual patients. According to a study by Hmelo, Gotterer, and Bransford. (1994) medical students who were trained using PBL showed greater use of hypothesis driven reasoning.

Simulators also provide the opportunity for teams of people to train, practice, or be evaluated on how they work as a group (Hammond, 2004). This is crucial since doctors and nurses who work in emergency care or surgery rarely work alone. Training within the work setting, including training with the people who will use the knowledge together on a real patient, will better prepare the learner to utilize this knowledge in a real situation.

It is important to note that while simulators provide excellent training opportunities, they do not fully convey what it is like to treat a living patient. The

simulator cannot represent every possible response from an actual patient (Wong, 2004). In addition, the cost of simulators may be prohibitive to many programs. Sin-Man, for example costs about \$30,000, USD (Peteani, 2004). In addition, two separate studies from the University of Toronto such suggest that while students enjoy learning through the use of a simulator and felt an increase in their confidence, they may gain just as much knowledge from watching videos or other methods of learning the material (Gilbert, Hutchison, Cusimano, & Regeher, 2000; Morgan, Cleave-Hogg, McIlroy, & Devitt, 2002). Both studies recommended further research into the use of simulators, including studying whether simulators result in greater long-term retention.

Education and CPD At a Distance

As mentioned earlier, the Internet is a valuable tool in the education and continuing professional development of health care providers. Examples and benefits of its use on-site have already been discussed, but the fact that the Internet is so portable makes it possible to disseminate information and link colleagues at a distance. There are a number of ways that this can be accomplished, including accessing journals, completing CPD credits online, or communicating with colleagues via synchronous and asynchronous discussion boards or email. This is very important as physicians and nurses in busy practices, rural areas, or who work varying shifts may have difficulty attending traditional courses or conferences. In addition, learning at a distance allows individuals to study at their own pace and when it is convenient for them, whether that is at home after their workday or at work between seeing patients.

Accessing journals online. The Internet has made it possible for health care providers to access the latest relevant journals without having to go to the library or

subscribing to a hard copy of the publication. Many medical and nursing journals can be accessed for free through the PubMed website which is run by the U.S. National Institute of Health (NIH). Since 1999 the Canadian Medical Association Journal (CMAJ) has been available online for free. For a fee, subscriptions can be obtained to databases such as Medline or to online editions of individual journals including The Journal of the American Medical Association (JAMA), Lancet, and British Medical Journal, all of which offer the option of full subscriptions or either one day or per article subscriptions. Other journals can be accessed from home or the library if the physician, nurse, or student is affiliated with an institution or organization that offers this service.

Distance Education. The first distance course for nurses involving technology was almost sixty years ago and involved using the telephone for an audio conference system (Armstrong, Gessener, & Cooper, 2000). Since then distance education has evolved to include television, email, web-based courses, and discussion boards and can be offered either synchronous or asynchronously. As new technology emerges, the possibilities for providing education at a distance continue to expand.

The Family Medicine Education and Research Network (FERN) in London, Ontario is a network of physicians who communicate via email, discussing issues they face as doctors. In a study including participants of FERN, physicians were presented with some information on a case and asked some questions to consider. They then responded to the questions based on their own knowledge and experience, and by accessing other resources for additional information. Participants engaged in discussions about the case through email. The researchers found that using email for CPD encouraged the physicians to make use of other online resources and make changes to their practice

(Marshall, , Stewart, & Ostbye, 2001). The physicians involved in the study found that using email for CME was very convenient because they did not need to be away from their practices to complete it.

Several medical schools throughout North America now offer some form of continuing education at a distance. These courses may include grand rounds transmitted via video, lectures by way of video on the Internet, online discussions, and other paper activities. Some of these methods of taking part in CPD are available for individuals to complete at home, while others require a set-up at a local hospital or other such facility.

Eleven Canadian universities partnered together to create MDcme.ca, a website offering university accredited continuing medical and continuing nursing education courses. Students in these courses can complete the work, including participation on asynchronous discussion boards, on their own time within the three to four weeks the course is being offered. The website also includes links to tutorials on e-learning to assist those who are new to the concept.

There are also commercial websites offering web-based CPD for health care providers such as CMEweb.com and eMedicine, which also has a large number of articles and images that can accessed for free (CME courses cost \$7.50 per hour of course). Government agencies, including the National Institute of Health also offer CME courses through a website. Bernard Sklar, a physician in California runs a website (<http://www.cmelist.com/>) listing online continuing medical education programs throughout the U.S. and Canada. Sklar created the website for his Masters thesis for the Graduate Program in Medical Information Science at the University of California, San Francisco. He continually updates the website to keep the listings current.

Distance CPD, however, does not have to include computer technology if that is not possible or desired. The Diabetes Centre at The Queen Elizabeth Hospital in Adelaide, Australia teamed up with the University of South Australia to produce an education program for physicians and nurses who deal with diabetes care (Hill, 1996). They developed conference-call tutorials to be completed by way of the telephone, much like that early nursing program. The tutorial included companion materials such as readings and independent activities.

Important Elements of Distance Learning

There are some key aspects that should be considered in the design of distance education materials. Simply taking a lecture seminar and disseminating it through video or audiotapes, or even a website is not effective distance education.

The materials should be learner-centered. Who the learner will be, what their needs and wants are, and what their prior knowledge of the materials and its method of delivery is must all be taken into account. Barrows and Tamblyn (1980) argue that with learner-centered education the learner is motivated by their own desire to learn the material as opposed to learning it for the approval of others through grades or credits for the course. This is very important in distance education since the learner must be self-directed to complete the material.

Distance education should also involve some form of collaboration or consultation with others. This allows for learners to share knowledge and experiences that may prove beneficial to their own learning as well as their colleagues taking the course. A number of studies have shown that when CPD for health care providers has included either synchronous or asynchronous discussions, the participants have had

greater satisfaction with the course and found greater success (Atak & Rankin, 2002; Curran, Hoekman, Guilliver, Landells, & Hatcher, 2000 ; Ortega, Burgun, Le Duff, & Le Beux, 2003) Some organizations, including the College of Family Physicians of Canada require that distance CPD include some method of discussion.

Barriers to Health Care Providers Using Technology

While using technology for education and professional development offers many opportunities, there are also several barriers to its use. Several studies have looked at this issue, with similar results, showing barriers related to knowledge, access, cost, and security concerns all being impediments to the use of technology for learning.

A lack of knowledge about how to use the technology is a common problem (Evans et al., 2001; Hughes & Pakieser, 1999; Mamary & Charles, 2000). If the learner is unfamiliar with how to use the computer, how to search the Internet, or how to use the course delivery software they are less likely to use the technology. In addition, a lack of access to the technology may also be an impediment. The learner may have access to a computer but cannot watch the streaming videos because they are using a dial-up connection instead of high-speed. This is another part of knowing the learner. Materials must be designed and presented in a way that the learner can use, but a lack of knowledge about how to use the technology on the part of the learner, should not deter the offering of education by way of technology. Mamary and Charles (2003) found that 75% of the physicians they surveyed were interested in receiving training in how to use the Internet and CD-ROM so that they could use them for completing professional development.

Security is another concern among potential learners. Learners worry about protecting their privacy as well as the privacy of their patients while using technology.

When learners must use computers in the work place, library, or other setting outside of their home, they have concerns about other people watching what they are doing or someone else accessing what they have been working on after the learner has left the computer (Hughes & Pakieser, 1999). The use of PDAs for tracking patient information, which is done in a number of training programs, can be a danger if a PDA is lost. Proper password protection should be in place to avoid problems in such an occurrence.

Cost can also be a major barrier to the use of technology. Personal digital assistants can cost anywhere from \$100 to more than \$600 (U.S). Many medical and nursing programs require students to buy the units themselves, which may prove to be a hardship. Practicing physicians will more likely be able to afford these. As mentioned earlier simulators can be very expensive, making the cost prohibitive to many programs. Peteani (2004) suggested that a facility could outsource the use of the simulator as a way of recouping some of the cost of purchase. While human-patient simulators can cost tens of thousands of dollars, smaller simulators may be more cost-effective.

What Now?

A recurring theme in most of the literature reviewed for this article was that more research must be done into the effectiveness of using technology for education and continuing professional development in health care. There are many questions that are in need of answers. Does the use of one type technology make learning more effective? What is the impact of using technology for medical and nursing education in terms of long-term retention? What is the most effective way of making these technologies affordable for more users?

Existing research shows that the use of technology for education and professional development is effective. Given this, the next step should be to look towards answering the pending questions and expanding and perfecting its current uses. Emphasis must also be placed on training learners in the use of these technologies. Without this, it will be difficult to encourage broader use of technology in the completion of educational credits and continuing professional development.

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